

ORDER

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION

8400.12

1/24/97

SUBJ: REQUIRED NAVIGATION PERFORMANCE 10 (RNP-10) OPERATIONAL APPROVAL

1. PURPOSE. The purpose of this Order is to provide policy and direction for obtaining operational approval of Required Navigation Performance 10 (RNP-10) capability. Guidance on airworthiness, continuing airworthiness, and RNP-10 operational approval are provided. The order enables an applicant to be approved as capable of meeting the **navigation element** of Communications/Navigation/Surveillance (CNS) requirements when RNP-10 is specified. The order does not address communications or surveillance requirements that may be specified to operate on a particular route or in a particular area. Those requirements are specified in other documents such as Aeronautical Information Publications (AIP) and the International Civil Aviation Organization (ICAO) Regional Supplementary Procedures Document (DOC 7030).

2. DISTRIBUTION. This order is distributed to the director level in Washington headquarters and the Centers; to all regional administrators; to the branch level in the Flight Standards Service, and Aircraft Certification Service; to the branch level in the regional Flight Standards divisions, and Aircraft Certification directorates; to all regional International Aviation Officers; to all Flight Standards, Aircraft Certification, and International Aviation field offices.

3. BACKGROUND.

a. States and operators are beginning implementation of RNP as part of a worldwide ICAO effort to implement the CNS and Air Traffic Management (ATM) concept. To support this effort, the Informal Pacific Air Traffic Service Coordination Group (IPACG) has developed plans to implement 50 Nautical Mile (NM) lateral separation on the North Pacific (NOPAC) and Central East Pacific (CEPAC) routes based on approval of a RNP-10 capability for the total route of the flight. In accordance with ICAO coordinated regional agreements, operators will be required to obtain approval to the RNP-10 criteria, or equivalent criteria developed by the operator's state of registry. This performance capability requirement is similar to the existing Minimum Navigation Performance Specification (MNPS) over the Atlantic.

b. Following the implementation of 50 NM lateral separation based upon a RNP-10 capability, additional separation reductions based on more stringent parameters will be implemented. The implementation of more stringent RNP capability, as well as other CNS elements, is part of a world wide ICAO coordinated effort to improve ATM and Future Air Navigation System (FANS) services. This first step is necessary to provide benefits to users in terms of efficient use of airspace, more optimum routings, reduced delay, increased traffic flow capacity, increased flexibility, reduced costs, appropriately adjusted aircraft to aircraft separation standards and increased safety.

4. APPLICABILITY.

a. This guidance applies to all operators conducting operations under Title 14 of the Code of Federal Regulations (14 CFR) parts 91, 121, 125, and 135.

Distribution: A-WXYZ-1; A-W(FS/IR)-3; A-X(FS/CD)-3;
A-X(IA)-2; A-FFS-0(MAX); A-FAC-O(MAX); A-FIA-0(MAX)

Initiated by: AFS-400

b. The requirements are consistent with 14 CFR part 91, sections 91.703(a)(1) and (a)(2), which require each certificate holder, operating a civil aircraft of U.S. registry outside of the United States, to comply with ICAO, Annex 2, when over the high seas, and to comply with the regulations of a foreign country when operating within that country's airspace.

5. RELATED PUBLICATIONS.

a. FAA documents.

(1) Part 121, Appendix G.

(2) Advisory Circular (AC) 20-130, Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors, latest edition.

(3) AC 20-138, Airworthiness Approval of Global Positioning System (GPS) Navigation Equipment for Use as a VFR and IFR Supplemental Navigation System, latest edition.

(4) FAA Order 7110.82, Monitoring of Navigation/Altitude Performance in Oceanic Airspace, latest edition

(5) FAA Order 8400.10, Air Transportation Operations Inspector's Handbook.

(6) FAA Order 8700.1, General Aviation Operations Inspector's Handbook.

b. Other documents.

(1) Copies of the following may be obtained from Document Sales Unit, ICAO, 999 University Street, Montreal, Quebec, Canada H3C 5H7:

(a) Manual on Required Navigation Performance (RNP), ICAO DOC 9613-AN/937.

(b) Asia Pacific Guidance Material for RNAV Operations.

(2) Copies of the following may be purchased from NOAA, N/ACC3, Distribution Division, Riverdale, MD 20737:

(a) United States Government Flight Information Publication - Chart Supplement - Alaska.

(b) United States Government Flight Information Publication - Chart Supplement - Pacific.

(3) Copies of Minimum Aviation System Performance Standards (MASPS): Required Navigation Performance for Area Navigation, RTCA, may be purchased from RTCA, Inc., 1140 Connecticut Avenue, NW., Suite 1020, Washington, DC 20036.

(4) Copies of Aeronautical Information Manual (AIM) may be purchased from the U.S. Government Printing Office, P.O. Box 371954, Pittsburgh, PA 15250-7954.

6. OPERATIONAL APPROVAL.

a. General. To obtain operational approval, aircraft eligibility must be determined, appropriate flightcrew procedures for the navigation systems to be used must be identified by the applicant (e.g., Class II Nav procedures), and database use and operating procedures must be evaluated, if applicable. Then appropriate operations specifications or a letter of authorization (LOA) may be issued, as applicable to the operator.

b. Approved Aircraft/System List. The Federal Aviation Administration (FAA) Technical Programs Division, AFS-400, will maintain a list of aircraft/navigation systems that have received approval. This list will be maintained for informational, statistical, and training purposes. The list IS NOT USED as a means of determining qualifications for approval, but may serve as a guideline to field offices and operators to note those aircraft and navigation systems which have been approved.

7. OPERATIONAL APPROVAL PROCESS. The following paragraphs provide application guidelines for operators desiring to obtain RNP-10 operational approvals. Appendix 5 is a checklist for the application process.

a. Application and Operator Approval. Each individual operator should schedule a preapplication meeting with either the certificate holding district office (CHDO) or the Flight Standards district office (FSDO). The intent of this meeting is to inform the operator of FAA expectations in regard to approval to operate in an RNP-10 airspace for a specified length of time; the contents of the operator's application; FAA review and evaluation of the application; and conditions for removal of the operational approval.

b. Operators seeking RNP-10 operational approval should contact FAA offices as follows:

(1) Parts 121, 125, and 135 Operators. These operators should notify the Certificate Management Office (CMO) or CHDO which holds its operating certificate of its intent to request approval for RNP-10 operations. RNP-10 authorizations for air carriers will be addressed through issuance of approved operations specifications. The operations specifications will identify any conditions or limitations necessary (e.g., navigation systems or procedures required, time limits, routes or areas authorized). A sample letter of request for an air carrier to obtain RNP-10 operational approval is provided in Appendix 3, figure 1.

(2) Part 91 Operators. These operators should contact their local FSDO to start the process for RNP-10 authorization. Operators under part 91 will receive an LOA, which authorizes RNP-10 operations. The LOA will identify any conditions or limitations necessary (e.g., navigation systems or procedures required, time limits, routes or areas authorized). A sample letter of request for a general aviation operator to obtain RNP operational approval and the resulting LOA are provided in Appendix 3, figure 2.

c. Determining Eligibility and Approval of Aircraft for RNP-10. Many aircraft and navigation system types currently in use in oceanic or remote area operations will qualify for RNP-10 based on one or more provisions of existing certification criteria. Thus, additional aircraft certification action may not be necessary for the majority of RNP-10 approvals. In these instances, additional aircraft certification will only be necessary if the operator chooses to claim additional performance beyond that originally certified or stated in the Airplane Flight Manual (AFM) and if the operator cannot demonstrate the desired performance through data collection. The certification approval for this situation is addressed in paragraph 9. Paragraph 11 contains guidance on the continuous airworthiness (maintenance) programs applicable to RNP-10 operations.

d. General Requirements and Criteria. RNP-10 requires that each individual aircraft must be determined to be qualified, and the individual operator must be approved by appropriate FAA offices before the operator

conducts flight in RNP-10 airspace. This Order provides guidance for the approval of operators for flight in airspace where RNP-10 is applied, and provides guidance on aircraft certification where RNP-10 eligibility cannot otherwise be determined, or where the operator chooses to lengthen RNP-10 approval time limits.

e. Contents of Operator's RNP-10 Application.

(1) Airworthiness Documents. Sufficient documentation should be available to establish that the aircraft has an appropriate AFM, AFM Supplement (AFMS), if applicable, and is otherwise suitably qualified to fly the intended routes (e.g., long-range navigation, communication).

(2) Description of Aircraft Equipment. The applicant should provide a configuration list which details pertinent components and equipment to be used for long range navigation and RNP-10 operations.

(3) RNP-10 Time Limit for Inertial Navigation Systems (INS) or Inertial Reference Units (IRU) (if applicable). The RNP-10 time limit for which the applicant's INS or IRU system have been approved should be provided (see paragraph 9). In addition, the applicant should consider the effect of headwinds in the area of operations in which RNP-10 operations are intended to be carried out (see paragraph 12).

(4) Operational Training Programs and Operating Practices and Procedures.

(a) Air carrier operators should submit training syllabi and other appropriate material to the FAA to show that the operational practices and procedures and training items related to RNP-10 operations are incorporated in various training programs where applicable (e.g., initial, upgrade, recurrent). Training for other personnel should be included where appropriate (e.g., dispatchers, maintenance). Practices and procedures in the following areas should be standardized using the guidelines of Appendix 4; flight planning; preflight procedures at the aircraft for each flight; procedures before entry into an RNP-10 route or airspace; inflight, contingency and flightcrew qualification procedures.

(b) Part 91 operators should confirm that they will operate using the practices and procedures identified in Appendix 4.

(5) Operational Manuals and Checklist.

(a) Part 121, 125, 135 Operators. The appropriate manual and checklists should be revised to include information/guidance on standard operating procedures detailed in Appendix 4. Appropriate manuals should include navigation operating instructions to include contingency procedures. Manuals and checklists should be submitted for review as part of the application process.

(b) Part 91 Operators. Should submit aircraft and navigation equipment manufacturer's checklist, as appropriate, for review as part of the application process. Appropriate manuals should include navigation operating instructions to include contingency procedures.

(6) Past Performance. An operating history for the operator should be included in the application. The applicant should address any events or incidents related to Class II Navigation Errors for that operator (e.g., Overseas Navigation Error Reports) which have been covered by training, procedures, maintenance, or the aircraft/navigation system modifications that are to be used.

(7) Minimum Equipment List (MEL). An MEL, consistent with the master minimum equipment list (MMEL), should be included addressing pertinent provisions for RNP-10 capability.

(8) Maintenance. The operator should submit a maintenance program for approval in accordance with paragraph 11 at the time the operator applies for operational approval.

f. Evaluation of Application, Conditions for Removal of Authorization, and Error Reports.

(1) FAA Review and Evaluation of Applications. Once the application has been submitted, the FAA will begin the process of review and evaluation. If the content of the application is insufficient, the FAA will request additional information from the operator. When all the airworthiness and operational requirements of the application are met, the FAA district office will issue the appropriate operations specifications or LOA for approval to operate in RNP-10 airspace, for a specific time period.

(2) Investigation of Navigation Errors. Demonstrated navigation accuracy provides the basis for determining the lateral spacing and separation necessary for traffic operating on a given route. Accordingly, lateral and longitudinal navigation errors are investigated to prevent their reoccurrence. Radar observations of each aircraft's proximity to the centerline and altitude before coming into coverage of short-range nav aids at the end of the oceanic route segment are typically noted by Air Traffic Service (ATS) facilities. If an observation indicates that an aircraft was not within an established limit, the reason(s) for the apparent deviation from centerline or altitude may need to be determined and steps taken to prevent a recurrence.

(3) Removal of RNP-10 Authorization. Oceanic Navigation Error Reports (ONER) and Oceanic Altitude Deviation Reports (OADR), for example, are established in FAA Order 7110.82, latest edition and in FAA Order 8700.1, chapter 223. When appropriate, FAA may consider these reports in determining remedial action. Repeated ONER or OADR occurrences attributed to a specific piece of navigation equipment, may result in withdrawal of operations specifications or rescinding an LOA, for use of that equipment. Information that indicates the potential for repeated errors may require a modification of an operator's training program. Information that attributes multiple errors to a particular pilot crew may necessitate remedial qualifications or airmen certification review.

8. RNP-10 REQUIREMENTS.

a. All aircraft operating in RNP-10 airspace shall have a 95% cross-track error of less than 10 NM. This includes positioning error, flight technical error (FTE), path definition error and display error. All aircraft shall also have a 95% along-track positioning error of less than 10 NM.

NOTE: For RNP-10 approval, navigation positioning error is considered the dominant contributor to cross-track and along-track error. Flight technical error, path definition error and display error are considered to be insignificant for the purposes of RNP-10 approval. (RNP-10 is intended for oceanic and remote areas where aircraft separation minima on the order of 50 NM are applied).

b. Satisfying requirements for an RNP-10 operation in oceanic and remote areas also necessitates that an operation identified in those parts of 14 CFR relevant to the type of operation conducted must also be satisfied, including at least dual carriage of navigation systems of integrity such that the navigation system does not provide misleading information with an unacceptable probability.

9. DETERMINING AIRCRAFT ELIGIBILITY.

a. Aircraft Eligibility Through RNP Certification (Group 1). Group 1 aircraft are those that have obtained formal certification and approval of RNP integration in the aircraft. RNP compliance is documented in the AFM, and is typically not limited to RNP-10. The AFM will address RNP levels that have been demonstrated and any related provisions applicable to its use (e.g., navaid sensor requirements). Operational approval of Group 1 aircraft will be based upon the performance stated in the AFM.

b. Aircraft Eligibility Through Prior Navigation System Certification (Group 2). Group 2 aircraft are those that can equate their certified level of performance, under previous standards, to the RNP-10 criteria. The standards listed in 9b(1) to 9b(5) can be used to qualify an aircraft under Group 2. Other standards may also be used if they are sufficient to ensure that the RNP-10 requirements are met. If other standards are to be used, the FSDO or CMO should consult with AFS-400 to determine the appropriate operational approval and limitations. As new standards are used for the basis of RNP-10, this Order will be revised to reflect the new standards.

(1) Aircraft which Qualify for the /E Suffix as Defined in the Aeronautical Information Manual (AIM). Aircraft equipped with Inertial Navigation Systems (INS), Inertial Reference Units (IRU), Radio Navigation Positioning Updating, and Electronic Map Displays, that qualify for the /E equipment suffix as defined in the AIM, are considered to meet all of the RNP-10 requirements for up to 5.0 hours of flight time. This time starts when the system is placed in the navigation mode or at the point where the system discontinues radio updating. If systems are updated en route, the operator must show the effect that the accuracy of the update has on the time limit.

(2) Aircraft Equipped with INS's or IRU's that have been Approved in Accordance with 14 CFR Part 121, Appendix G. Inertial systems approved in accordance with part 121, appendix G, are considered to meet RNP-10 requirements for up to 5.0 hours of flight time. This time starts when the system is placed in the navigation mode or at the point where the systems are updated. If systems are updated en route, the operator must show the effect that the accuracy of the update has on the time limit. INS accuracy, reliability, training, and maintenance issues that are required by section 121.355, appendix G, are considered to be applicable to an RNP-10 authorization, including any associated Class II navigation procedures. At least dual equipage of eligible INS systems is required.

(3) Aircraft Equipped with Global Positioning Systems (GPS) Approved to Primary Means of Navigation Standards. Aircraft approved to use GPS as a primary means of navigation for oceanic and remote operations in accordance with the appropriate FAA documents, or equivalent, are considered to meet the RNP-10 requirements. The AFM(s) should indicate if a particular GPS installation meets the appropriate FAA documents requirements. As specified in the appropriate FAA documents, at least dual GPS equipment is required, and an approved dispatch fault detection and exclusion (FDE) availability prediction program must be used. The prediction program should be used with a lateral separation protected area of 20 NM for RNP-10. The maximum outage time should be included as a condition of the RNP-10 approval.

NOTE: If predictions indicate that the maximum FDE outage for the intended RNP-10 operation cannot be met, then the operation must be rescheduled when FDE is available, or RNP-10 must be predicated on an alternate means of navigation.

(4) Multisensor Systems Integrating GPS (with GPS Integrity Provided by Receiver Autonomous Integrity Monitoring (RAIM)). Multisensor systems integrating GPS with RAIM that are approved using the guidance of FAA AC 20-130A, Airworthiness Approval of Navigation or Flight Management Systems

Integrating Multiple Navigation Sensors, or equivalent, can be considered to meet RNP-10 requirements without time limitations. In this case, the INS or IRU must be approved in accordance with part 121, appendix G.

(5) Aircraft Equipped with INS's or IRU's Approved for Minimum Navigation Performance Specification or Australian Separation Standards Operations. Aircraft equipped with dual INS's or IRU's approved for MNPS or AUSEP operations can be considered to meet RNP-10 requirements for up to 5.0 hours after the system is placed in the navigation mode or en route update. If systems are updated en route, the operator must show the effect that the accuracy of the update has on the time limit.

NOTE: Neither Omega or Doppler systems can be approved for RNP-10.

c. Aircraft Eligibility Through Data Collection (Group 3). A data collection program meeting provisions of Appendix 1 may be proposed by the applicant and accepted by FAA. A data collection program should address appropriate navigation accuracy requirements for RNP-10. The data collection must ensure that the applicant demonstrates to the FAA that the aircraft and navigation system provides the flightcrew with navigation situational awareness relative to the intended RNP-10 route, that a clear understanding of the status of the navigation system is provided, and that failure indications and procedures are consistent with maintaining the required navigation performance.

d. Obtaining Approval for an Extended Time Limit for INS or IRU Systems. The baseline RNP-10 time limit for INS and IRU systems (after the system is placed in the navigation mode or after en route update) is 5.0 hours, as detailed in paragraphs 9b(1)(2) and (5). This time limit may be extended by one of the following methods:

(1) An extended time limit may be established when RNP is integrated into the aircraft navigation system through a formal certification process (as described in paragraph 9a).

(2) When an INS or IRU has been approved using an existing approval standard (as detailed in paragraphs 9b(1)(2) and (5)), an extended time limit may be established by an applicant presenting justifying data to the appropriate Aircraft Certification Office.

(3) An applicant may establish an extended time limit by showing that the carriage of multiple navigation sensors, that mix or average navigation position error, justifies such an extension (e.g., triple mixed INS's). If the applicant uses a time limit based on mixing, then the availability of the mixing capability is required for 14 CFR parts 121, 125, and 135 dispatch or for part 91 takeoff for flight on RNP-10 routes. If the mixing or averaging function is not available at dispatch, then the applicant must use a time limit that does not depend on mixing.

(4) When an INS or IRU has been approved using an existing approval standard, an applicant can establish an extended time limit by conducting a data collection program in accordance with the guidance provided in Appendix 1.

e. Conditions under which Manual Radio Position Updating may be Considered as Acceptable for Flight in Airspace where RNP-10 is Required. If manual updating is not specifically approved, manual position updates are not permitted in RNP-10 operations. Manual radio updating may be considered acceptable for operations in airspace where RNP-10 is applied provided that:

(1) Procedures for manual updating are reviewed by AFS-400 on a case-by-case basis.

(2) The operator shows that updating procedures and training contain measures/cross checking to prevent blunder errors.

(3) The operator provides data that establishes the accuracy with which the aircraft navigation system can be updated using manual procedures and representative navigation aids. Data should be provided that shows the update accuracy achieved in in-service operations. (This factor must be considered when establishing the RNP-10 time limit for INS's or IRU's).

(4) Crew qualification curriculum is found to provide effective pilot training.

10. MEL. Operators should make any necessary MEL adjustments through their CHDO, as necessary, as applicable to RNP-10 operations. MEL applicability to systems such as INS, single or dual FMS, Distance Measuring Equipment (DME) updating capability, and mode or annunciation capability should be clearly specified as appropriate to the procedures intended for use.

11. CONTINUING AIRWORTHINESS (MAINTENANCE REQUIREMENTS).

a. General. The holder of the design approval, including either the type certificate (TC) or supplemental type certificate (STC) for the individual navigation shall furnish at least one set of complete Instructions for Continued Airworthiness for the maintenance requirements for operations conducted in accordance with this Order.

b. Maintenance Documents Requirements. The following items should be reviewed as appropriate for RNP-10 maintenance approval:

- (1) Maintenance Manuals
- (2) Structural Repair Manuals
- (3) Standard Practice Manuals
- (4) Illustrated Parts Catalogs
- (5) Maintenance Schedule
- (6) MMEL/MEL

12. OPERATIONAL REQUIREMENTS.

a. Applying the RNP-10 Time Limit to Operations for Aircraft Equipped with Only INS's or IRU's. As detailed in paragraph 9, an RNP-10 time limit must be established for aircraft equipped with INS's or IRU's. When planning operations in areas where RNP-10 is applied, the operator must establish that it will comply with the time limitation on the routes that it intends to fly. In making this evaluation, the operator must consider the effect of headwinds. The operator may choose to make this evaluation on a one time basis or on a per flight basis. The operator should consider the following in making this evaluation:

(1) Route Evaluation. The operator must establish its capability to comply with the RNP-10 time limit on all RNP-10 routes (fixed or flexible tracks) on which it intends to fly.

(2) Start Point for Calculation. The calculation should start at the point where the system is placed in the navigation mode or the point where it is expected to be updated.

(3) Stop Point for Calculation. The stop point may be one of the following:

(a) the point at which the aircraft will begin to navigate by reference to ICAO Standard Nav aids (VOR, DME, NDB) and/or comes under radar surveillance from ATC; or

(b) the point at which the navigation system is expected to be updated.

(4) Sources of Wind Component Data. The headwind component to be considered for the route may be obtained from any source found acceptable to the FAA. Acceptable sources for wind data include: National Weather Service, Bracknell, industry sources such as Boeing Winds on World Air Routes, and historical data supplied by the operator.

(5) One Time Calculation Based on 75% Probability Wind Components. Certain sources of wind data establish the probability of experiencing a given wind component on routes between city pairs on an annual basis. If an operator chooses to make a one time calculation of RNP-10 time limit compliance, it may use the annual 75% probability level to calculate the effect of headwinds (this level has been found to be a reasonable estimation of wind components).

(6) Calculation of Time Limit For Each Specific Flight. The operator may choose to evaluate each individual flight using flight planned winds to determine if the aircraft will comply with the specified time limit. If it is determined that the time limit will be exceeded, then the aircraft must fly an alternate route or delay the flight until the time limit can be met. This evaluation should be considered a flight planning or dispatch task..

b. Operators should use the appropriate FAA or ICAO flight plan designation specified for the RNP-10 route flown. The letter "R" should be placed in Block 10 of the ICAO flight plan to indicate that the pilot has reviewed the planned route of flight to determine RNP-10 requirements and the aircraft and operator have been approved by the FAA to operate in areas or on routes where RNP-10 is a requirement for operation.

c. At dispatch or during flight planning, the operator should ensure that adequate navigation aids are available en route to enable the aircraft to navigate to RNP-10.

NOTE: The letter that indicates RNP approval has not yet been established for FAA flight plans.

13. DISCUSSION OF CERTIFICATION ACTIONS RELATED TO RNP-10.

a. The operator may elect to certify the aircraft navigation performance to a new standard to take advantage of the aircraft capability. The aircraft may obtain credit for improved performance through operational data collection, in which case certification is not necessary. The following paragraphs provide guidelines for different types of navigation systems. The applicant must propose an acceptable means of compliance for any systems not identified below.

(1) Aircraft Incorporating INS. For aircraft with INS certified under part 121, appendix G, additional certification is only necessary for operators who choose to certify INS accuracy to better than 2 NM per hour. Aircraft originally certified to a different standard may elect to upgrade their certification to be compliant with appendix G, using a more stringent accuracy standard.


(a) The certification of INS performance must address all issues associated with maintaining the required accuracy including, accuracy and reliability, acceptance test procedures, maintenance procedures, and training programs. AC 25-4, Inertial Navigation Systems (INS), describes an acceptable means of addressing these issues.

(b) The applicant should identify the standard against which INS performance is to be demonstrated. This standard may be a regulatory (i.e., appendix G), industry, or applicant unique specification. Consistent with AC 25-4, paragraph 5b(4), a statement should be added to the AFM identifying the accuracy standard used for certification.

(2) AC 20-138. Provides an acceptable means of compliance for aircraft that use GPS, but do not integrate it with other sensors. AC 20-130A, describes an acceptable means of compliance for multi-sensor navigation systems that incorporate GPS. Aircraft which intend to use GPS as the only navigation system in RNP-10 airspace (e.g., no IRS or INS), must also comply with the requirements of the appropriate FAA documents, or equivalent.

b. The equipment configuration used to demonstrate the required accuracy must be identical to the configuration which is specified in the MEL.

c. The equipment configuration used to demonstrate the required accuracy must be supportable in RNP-10 oceanic and remote airspace. For example, the statistical benefit of estimating position using INS position data filtered with DME data, will not be considered.



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APPENDIX 1. AIRCRAFT ELIGIBILITY THROUGH DATA COLLECTION

1. GENERAL.

a. This appendix offers broad guidance to principal operation inspectors (POI) in the use of a statistical procedure to determine whether aircraft should be approved for flight in RNP-10 airspace. Inspectors are to consider each application on its own merit, and should weigh such factors as the operator's experience, crew training procedures, the locations at which error data are accumulated (e.g., NOPAC, CEPAC, NAS, MNPS), and the age of the data, and should request a review of the data by the FAA navigation specialists or by AFS-400.

b. RNP-10 approvals will be issued for specific combinations of aircraft and navigation systems. If the navigation system which is a candidate for RNP-10 is an INS, IRS or any other system whose accuracy decreases with increasing flight time, the approval must be limited to the number of hours in which the aircraft can be expected to satisfy both the lateral ("cross-track") and longitudinal ("along-track") accuracy criteria of RNP-10.

c. This appendix refers to using data collected from "trials" to establish that a system will meet RNP-10. In the context of the appendix, "trials" means an individual data point where the aircraft navigation system position is evaluated against a "reference system" position (eg., VOR/DME). A trial or data point is collected on an individual flight. The appendix describes a statistical test which uses data gathered from several "trials." In each trial the operator measures two errors:

- (1) the longitudinal position-determination error of the candidate's navigation system; and
- (2) the lateral displacement error of the candidate's aircraft from its planned route center line.

d. The longitudinal position-determination error measured in the i^{th} trial is called a_i , the lateral displacement error measured in the i^{th} trial is called c_i . In order for the statistical test to be valid, the data gathered in each trial must be independent of those gathered in any other trial. In other words, the outcome of each trial must not influence the outcome of any subsequent trial. In general, data is to be gathered after an aircraft has flown a time at least equivalent to that for which operational approval is requested, guided solely by the navigation system which is a candidate for RNP-10 approval. Each trial, therefore, requires a separate flight.

e. An operator requesting RNP-10 approval for a candidate aircraft and navigation system must inform the FAA of the flights during which the operator plans to collect error data. The operator should collect data on every eligible flight until the statistical procedure described in this appendix indicates that the data collection should cease. The operator must use all valid data. In particular, the operator may not ignore data which show large errors and submit only those showing small errors.

2. DATA COLLECTION GUIDELINES.

a. Operators using the methods described in this appendix are to collect position estimates and use those estimates to compute the lateral and longitudinal errors of their aircraft. If a combination of aircraft and navigation system is a candidate for RNP-10 approval for a stated number of hours h , the data must be collected after the aircraft has used only that navigation system for at least h hours.

b. In order to determine the lateral and longitudinal error data, the operator must simultaneously obtain positions estimates from:

(1) the navigation system which is a candidate for RNP-10 approval and which has guided the aircraft for at least the preceding h hours; and

(2) a reference system which must be highly accurate in the area where the aircraft is conducting the data collection.

c. The estimate from the reference system is taken to represent the aircraft's actual position. The position must be measured simultaneously, at a time when the aircraft has been flying along a straight segment of its planned route for several minutes, and is expected to continue flying along that segment for several more minutes.

d. The operator is responsible for establishing that reference system positions are accurate. The operator may wish to consider the following in selecting reference systems:

(1) DME/DME positions taken within 200 NM of both DME stations, derived automatically and displayed on systems such as Flight Management Computers.

(2) GPS derived positions.

(3) VOR/DME positions taken within 25 NM of the navigation aid.

e. The positions simultaneously reported by the candidate system and the reference system must both be expressed (or re-expressed) in terms of the same coordinate system. The longitudinal error a_i is the distance between the position reported by the reference system and the position reported by the candidate system, measured along a line parallel to the planned route of flight. (Thus, if the two reported positions are connected by a vector, and the vector is resolved into a component parallel to the route and a component perpendicular to the route, a_i is the magnitude of the component parallel to the route). The lateral deviation c_i is the distance between the planned route of flight and the position reported by the reference system. The distances a_i and c_i must be the absolute error distance expressed in NM. Errors are expressed in absolute terms so that longitudinal errors in opposite directions do not offset each other; nor do lateral errors to the left and right offset each other.

f. Suppose for example, that an operator wishes to obtain RNP-10 approval of an airplane equipped with an INS, and that the RNP-10 time limit being sought for the INS is 6 hours. Suppose also that the airplane can very accurately determine its position when it is in such airspace with multiple DME coverage, and that it usually enters a large block of airspace $5\frac{1}{2}$ hours after last using another navigation system or signal to adjust its INS output. On each occasion when:

(1) the airplane is flying in an area of multiple DME coverage;

(2) at least 6 hours have passed since the last adjustment of INS output; and

(3) the airplane has been flying straight for several minutes, and is expected to continue flying straight for several more minutes; the crew records the time, desired track, and the position reported by its INS and its multiple-DME position-determination system. The operator later computes the longitudinal and lateral error data, a_i and c_i .

g. It is recommended, but not mandatory, that operators planning to use their aircraft in a particular route system should gather error data from flights through that system (e.g., NOPAC, CEPAC). If operations are

planned in a new area of operations (different from that where data was collected), the operator should show that system accuracy will not be significantly affected by factors such as the direction of flight, etc.

h. The operator should develop a standard form on which to document data for each flight. It should include:

- (1) Date
- (2) Departure airport
- (3) Destination airport
- (4) Aircraft type, series and N number
- (5) Make/model of navigation system
- (6) Time system placed in navigation mode
- (7) If applicable, time aircraft navigation system was updated en route
- (8) Time that reference position was taken
- (9) Source of reference position (eg., VOR/DME, DME/DME)
- (10) Reference position coordinates
- (11) Aircraft navigation system position coordinates
- (12) Desired track
- (13) To be calculated post flight: lateral and longitudinal error estimated per the guidance in this appendix
- (14) Gate check information: Gate coordinates, individual INS or IRU coordinates, calculated error rate

3. STATISTICAL PROCEDURES.

a. Background. Sequential sampling procedures are used to determine whether a candidate aircraft and navigation system should be approved for flight in RNP-10 airspace. After each trial the operator recomputes certain statistics and compares them to numbers indicated below. The comparison will infer one of three possible results:

- (1) the candidate aircraft and navigation system satisfy the RNP-10 performance requirements, and the statistical test is terminated;
- (2) the candidate aircraft and navigation system do not satisfy the RNP-10 performance requirements, and the statistical test is terminated; or
- (3) the operator needs to perform another trial (i.e., gather more data) and continue the statistical test, as it cannot yet reach a decision with the required level of confidence.

b. A sequential sampling procedure typically requires fewer trials than does a statistical test which has a fixed number of trials and has the same probability of making the correct decision. In general, the better an aircraft navigates, the fewer trials it will need to "pass" the test; i.e., to demonstrate RNP-10 compliance. However, for the FAA to have sufficiently high confidence in the test results, even an aircraft that navigates perfectly will need to perform at least 13 trials in order to demonstrate that it meets the RNP-10 lateral containment criterion, and at least 19 trials to demonstrate that it meets the RNP-10 longitudinal accuracy criterion. An aircraft that navigates poorly will need relatively few trials before "failing" the test. The test has been designed so that the average number of trials needed for it to reach a decision is approximately 100.

c. Test of Lateral Conformance. To establish whether or not the navigation system can meet RNP-10 in the lateral dimension, the operator may use the mathematical process described in this paragraph or use the graph provided in figure 1, as described in paragraph 3e. After conducting at least 13 trials, the operator should add together all of the lateral deviations obtained up to that point. Suppose, in particular, that

n trials have been conducted. If the sum of the lateral deviations does not exceed $2.968n - 37.853$, the candidate aircraft and navigation system have demonstrated compliance with the RNP-10 lateral containment criterion and the operator should stop computing lateral deviation data. If the sum of the lateral deviations equals or exceeds $2.968n + 37.853$, the candidate aircraft and navigation system have demonstrated that they do not meet the RNP-10 lateral containment criterion and the operator should stop computing lateral deviation data. If the sum of the lateral deviations is between $2.968n - 37.853$ and $2.968n + 37.853$, the test cannot yet yield a decision. The operator must perform another trial to obtain an additional lateral deviation. This new lateral deviation is added to the sum obtained previously and the new sum is compared to $2.968(n+1) - 37.853$ and $2.968(n+1) + 37.853$.

d. In other words, let $S_{c,n} = c_1 + c_2 + \dots + c_n$ be the sum of (the absolute values of) the lateral deviations obtained in the first n trials. If $S_{c,n} \leq 2.968n - 37.853$, the aircraft and its navigation system pass the lateral conformance test. If $S_{c,n} \geq 2.968n + 37.853$, the aircraft and its navigation system fail the lateral conformance test. If $2.968n - 37.853 < S_{c,n} < 2.968n + 37.853$, the operator must:

- (1) perform another trial to obtain c_{n+1} ;
- (2) compute $S_{c,n+1} = c_1 + c_2 + \dots + c_n + c_{n+1}$ ($= S_{c,n} + c_{n+1}$);
- (3) compare $S_{c,n+1}$ to $2.968(n+1) - 37.853$ and to $2.968(n+1) + 37.853$; and
- (4) determine whether the candidate aircraft and navigation system pass the test or fail the test, or whether an $(n + 2)^{\text{th}}$ trial is needed.

e. Figure 1 illustrates these rules for the lateral conformance test. The operator may wish to plot points on figure 1 as lateral deviation data are collected. The abscissa (horizontal component) of each plotted point is n , the number of trials completed; and the ordinate (vertical component) of each point is $S_{c,n}$, the sum of the (absolute values of the) lateral deviations observed in the n trials. The test ends as soon as a point falls into the lower right region or the upper left region of the graph. If a point is plotted in the lower right region, the aircraft/navigation system has shown that it satisfies the RNP-10 lateral containment criterion. If a point is plotted in the upper left region the aircraft/navigation system has demonstrated that it does not meet the criterion. Whenever a point is plotted in the middle region, the operator needs to accumulate more data.

f. In the event that the tests of $S_{c,n}$ do not yield a decision on the aircraft's lateral performance after 200 trials, the operator should perform the following computations: (If D_c^2 does not exceed 18.649, the aircraft and navigation system satisfy the RNP-10 lateral containment criterion. If D_c^2 does exceed 18.649, the aircraft and navigation system do not meet the criterion, and do not qualify for RNP-10 approval.)

- (1) Compute the quantity $D_1 = c_1^2 + c_2^2 + \dots + c_{200}^2$
- (2) Compute the quantity $D_2 = \frac{S_{c,200}^2}{200} = \frac{(c_1 + c_2 + \dots + c_{200})^2}{200}$
- (3) Compute the quantity $D_c^2 = \frac{D_1 - D_2}{200}$

g. Test of Longitudinal Accuracy. To establish whether or not the navigation system can meet RNP-10 in the longitudinal dimension the operator may use the mathematical process described in paragraphs 3h and 3i or use the graph provided in figure 2, as described in paragraph 3j.

h. After conducting at least 19 trials, the operator should add together the squares of all the longitudinal errors obtained up to that point. Suppose, for example, that n trials have been conducted. If the sum of the squares of the longitudinal errors does not exceed $22.018n - 397.667$, the aircraft and navigation system have demonstrated compliance with the RNP-10 longitudinal accuracy requirement, and the operator should stop computing longitudinal error data. If the sum of the squares of the longitudinal errors exceeds $22.018n + 397.667$, the aircraft and navigation system have demonstrated that they do not meet the RNP-10 longitudinal accuracy requirement, and the operator should stop computing longitudinal error data. If the sum of the squares of the longitudinal errors is between $22.018n - 397.667$ and $22.018n + 397.667$, the test cannot yield a decision. The operator must perform another trial to obtain an additional longitudinal error. The square of this new longitudinal error is added to the sum obtained previously, and the new sum is compared to $22.018(n+1) - 397.667$ and to $22.018(n+1) + 397.667$.

i. In other words, let $S_{a,n} = a_1^2 + a_2^2 + \dots + a_n^2$ be the sum of the squares of the longitudinal errors obtained in the first n trials. If $S_{a,n} \leq 22.018n - 397.667$, the aircraft and its navigation system pass the longitudinal accuracy test. If $S_{a,n} \geq 22.018n + 397.667$, the aircraft and its navigation system fail the longitudinal accuracy test. If $22.018n - 397.667 < S_{a,n} < 22.018n + 397.667$, the operator must:

- (1) perform another trial to obtain another longitudinal error a_{n+1} ;
- (2) compute $S_{a,n+1} = a_1^2 + a_2^2 + \dots + a_n^2 + a_{n+1}^2 (=S_{a,n} + a_{n+1}^2)$;
- (3) compare $S_{a,n+1}$ to $22.018(n+1) - 397.667$ and to $22.018(n+1) + 397.667$; and
- (4) determine whether the candidate aircraft and navigation system pass the test or fail the test, or whether an $(n+2)^{\text{th}}$ trial is needed.

j. Figure 2 illustrates the rules for the sequential test of longitudinal accuracy. The operator may wish to plot points on figure 2 as longitudinal error data are collected. The abscissa (horizontal component) of a plotted point is n , the number of trials completed; and the ordinate (vertical component) of a point is $S_{a,n}$, the sum of the squares of the longitudinal errors observed in the n trials. The test ends as soon as a point falls in the lower right hand region or the upper left hand region of the graph. If a point is plotted in the lower right hand region, the candidate aircraft and navigation system have shown that they satisfy the RNP-10 longitudinal accuracy criterion. If a point is plotted in the upper left region, the aircraft and navigation system have demonstrated that they do not meet that criterion. Whenever a point is plotted in the middle region, the operator needs to accumulate more data.

k. In the event that the sequential sampling procedure described above does not yield a decision on the aircraft's longitudinal performance after 200 trials, the operator should perform the following computations: (If D_a^2 does not exceed 21.784, the aircraft and navigation system satisfy the RNP-10 longitudinal accuracy

criterion. If D_a^2 does exceed 21.784, the aircraft and navigation system do not meet the criterion, and do not qualify for RNP-10 approval.)

(1) Compute the quantity $D_3 = \frac{(a_1 + a_2 + \dots + a_{200})^2}{200}$.

(2) Compute the quantity $D_a^2 = \frac{S_{a,200} - D_3}{200}$.

Figure 1: Acceptance, Rejection, and Continuation
Regions for Sequential Test of Lateral Conformance

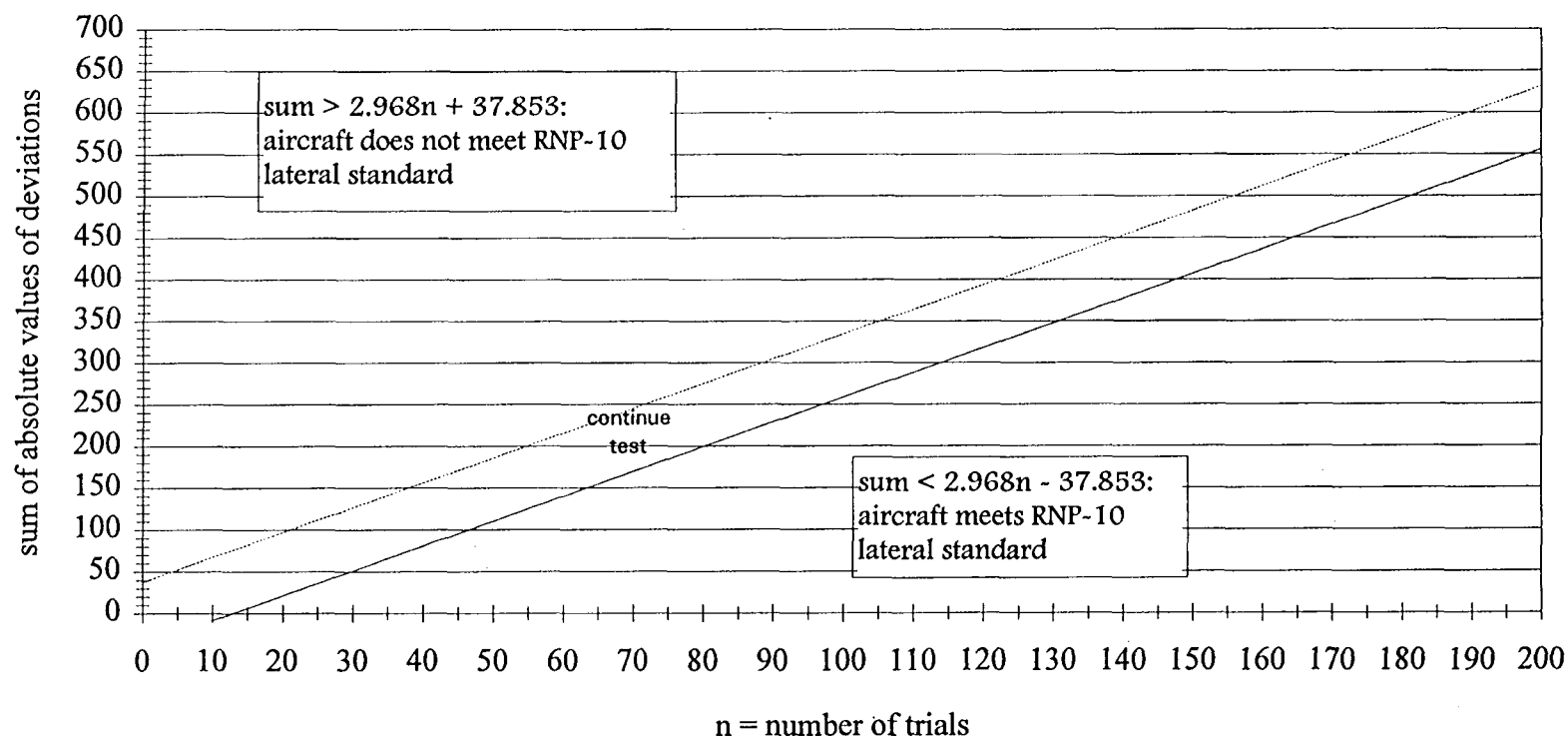
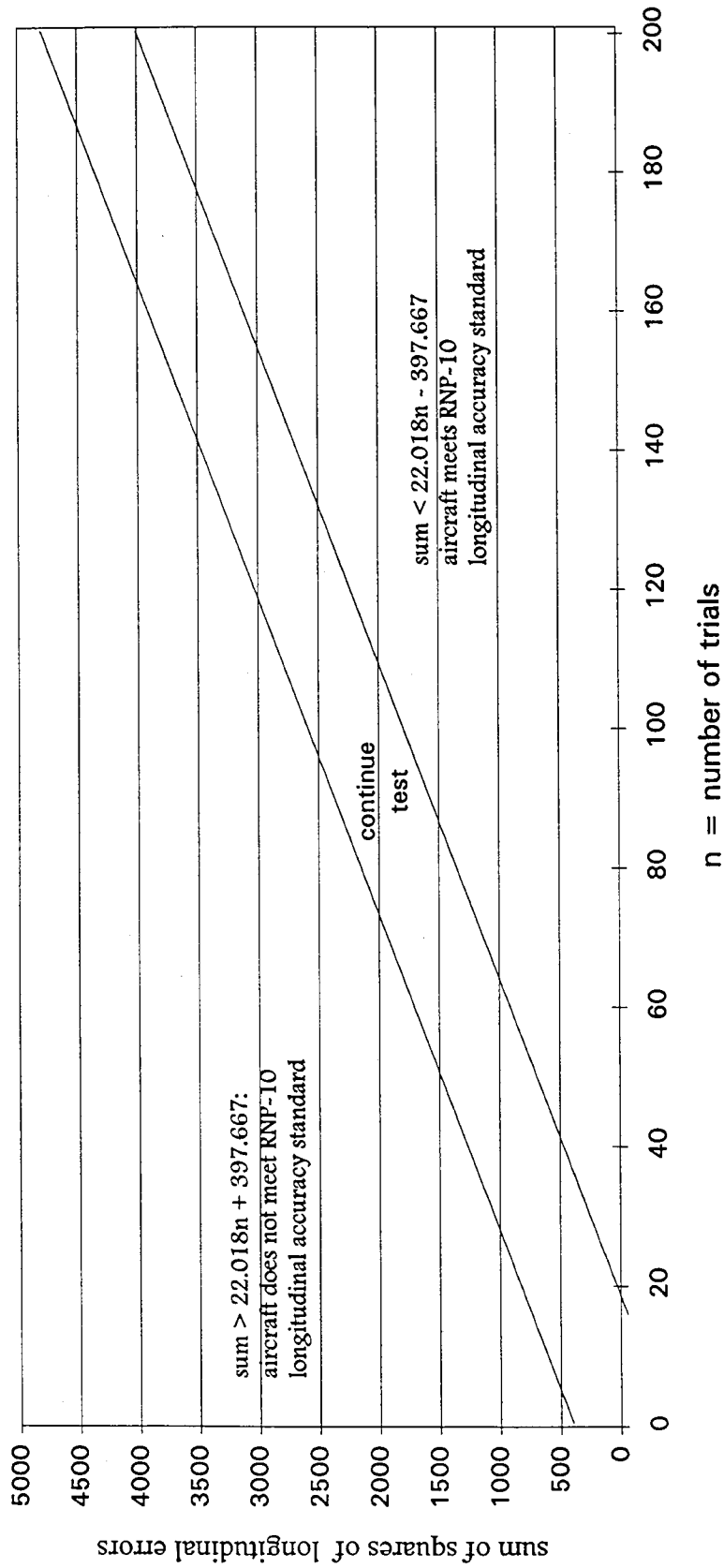


Figure 2: Acceptance, Rejection and Continuation
Regions for Sequential Test of Longitudinal Accuracy



APPENDIX 2. CERTIFICATION OF IRU PERFORMANCE

1. GUIDELINES AND ASSUMPTIONS. IRU's that meet the current requirements of part 121, appendix G, meet all of the RNP-10 requirements for up to 5.0 hours of flight time without radio position updating. IRU accuracy, reliability, training, and maintenance issues that are required by appendix G, are part of the aircraft certification. However, IRU manufacturers believe that the actual performance of some types of IRU's exceeds the current appendix G requirements. A methodology for analyzing IRU performance, combined with requirements to update IRU manufacturer's Specification Control Drawings (SCD), Acceptance Test Procedures (ATP), and airline IRU maintenance /removal criteria is described in the following paragraph.

2. CERTIFICATION GUIDELINES.

a. IRU Accuracy and Reliability. IRU accuracy and reliability must be analyzed in conjunction with the flight management system interface. An analysis performed on a specific manufacturer's aircraft model is not necessarily applicable to other aircraft operating the same equipment. However, other aircraft may be analyzed using the same or equivalent methodology as proposed herein.

(1) The Radial Navigation Error Distribution for IRU's is Modeled by a Rayleigh Distribution. The 95% statistic of radial position error will be used when demonstrating compliance. It is assumed that cross-track and along-track errors are Gaussian, independent, and have equal variances.

(2) The Radial Position Error will be Evaluated for the Range of the Independent Time Variable (time in navigation), as certified for the IRU navigation maximum time (e.g., 18 hours).

(3) Time-Dependent Position Error Data will be Presented. Other non-inertial error sources will not be considered as part of the IRU certification (i.e., flight technical error). Therefore, the maximum time duration of flight operations in RNP-10 airspace will be evaluated and determined as part of the operational approval.

(4) The Assessment of Navigation Performance may Employ System Analysis, IRU Error Modeling (Covariance Analysis), and System Simulation. Analytical findings may be validated with empirical data from laboratory testing and aircraft flight testing, as applicable.

b. When credit is required for IRU performance that is superior to the original certification, the existing IRU specification control drawings for the IRU Type Designs should be revised to account for the new tighter tolerance system error budgets. If it has been determined that all IRU's for a given part number meet the minimum requirements of the new performance standard, then the IRU part number may remain the same. When only some of the IRU's for a given part number meet the minimum requirements of the new performance standard, then screening is required and part number updates will be required to identify the IRU's which are compliant to the new performance standard.

c. The AFM or AFM Supplement (AFMS) must be modified to reflect the certification of IRU's to tighter accuracy requirements, consistent with AC 25-4, paragraph 5b(4). The AFM should provide sufficient time-dependent information so that the maximum time in RNP-10 airspace can be assessed as part of the operational approval.

d. In addition, production and field acceptance test procedures will require an update by the supplier, to ensure that the installed IRU meets the tighter accuracy tolerance required.

e. Operator maintenance procedures will require updating to ensure appropriate monitoring of IRU performance to the new requirements contained in this Order, and replacement of IRU's on aircraft that do not meet the navigation performance of this new criteria.

f. Procedures for flight operations should be identified and applied to ensure IRU alignment before extended range flights and time-in-navigation for the intended time duration of flight in RNP-10 airspace.

APPENDIX 3. DOCUMENTATION REQUIRED TO COMPLETE THE APPROVAL PROCESS**FIGURE 1. SAMPLE LETTER OF REQUEST BY AN AIR CARRIER TO OBTAIN
RNP-10 OPERATIONAL APPROVAL****SUBJECT:** Request for Required Navigation Performance (RNP) - 10 Approval**TO:** Appropriate POI

[Insert Airline Name] request that Operations Specifications approval be issued to conduct en route operations on RNP [insert number] of [insert number] hours between updates on designated routes.

The following [Insert Airline Name] aircraft meet the requirements and capabilities as defined/specified in Federal Aviation Administration Order [insert the number of this Order], dated [insert the date of this Order] for a RNP-10 qualification.

AIRCRAFT TYPE/SERIES	RNP-10 TIME LIMIT *	NAVIGATION EQUIPMENT	COMMUNICATIONS EQUIPMENT
B-747-400		List Nav Equip by Name and Type/Manuf/Model	List Com Equip by Name and Type/Manuf/Model
B-737-500		List Nav Equip by Name and Type/Manuf/Model	List Com Equip by Name and Type/Manuf/Model
MD-11		List Nav Equip by Name and Type/Manuf/Model	List Com Equip by Name and Type/Manuf/Model

Note: The above listed aircraft are samples only.

Training of flight crews have been accomplished in accordance with applicable FAA regulations and guidance material.

* If unlimited time is requested, state: "Unl."

Sincerely,

[insert typed name and signature]

[insert title]

**APPENDIX 3. DOCUMENTATION REQUIRED TO COMPLETE THE APPROVAL PROCESS
(continued)**

**FIGURE 2. SAMPLE LETTER OF REQUEST BY A GENERAL AVIATION OPERATOR TO OBTAIN
RNP-10 OPERATIONAL APPROVAL**

SUBJECT: Request for a Letter of Authorization (LOA) to conduct Required Navigation Performance (RNP)

TO: Appropriate Flight Standards District Office (FSDO)

Operators must submit requests by letter with a separate page containing the "Format for an LOA to Operate at RNP-10" as shown on the following page.

LOA's

Aviation safety inspectors (ASI) can administratively issue an LOA to any general aviation operator that has an aircraft-navigation system meeting the requirements of this Order. The procedure for the issuance of the LOA is identical to the procedure contained in FAA Order 8700.1, chapter 222, with the exception that the format for the LOA has been modified to meet the specific requirements of an RNP approval. The format to be used is contained on the following page and may be copied or retyped at the convenience of the operator. If the LOA is retyped, inspectors will ensure that every item appearing in the sample, is included in the operator's version.

APPENDIX 3. DOCUMENTATION REQUIRED TO COMPLETE THE APPROVAL PROCESS
(continued)**FORMAT FOR AN LOA TO OPERATE AT RNP-10**

This letter constitutes approval for the named aircraft to operate or to conduct oceanic/remote area flight on routes specified as RNP-10 routes at the level indicated by the authorized operator or crew listed under the conditions and limitations below.

Aircraft make and model _____ N-Number _____
Aircraft serial number _____ Aircraft color _____

NAVIGATION EQUIPMENT			RNP-10
TYPE/MANUFACTURER/MODEL	PART NUMBER	DATE INSTALLED	TIME LIMIT

COMMUNICATION EQUIPMENT		
TYPE/MANUFACTURER/MODEL	PART NUMBER	DATE INSTALLED

Aircraft base of operations (city, state, zip) _____
Name of aircraft owner/operator _____
Crew training conducted by _____
Print name of person responsible for crew operations or agent for service (must be a U.S. citizen) _____

Signature of person responsible for crew operations or agent for service _____

Street address (cannot be a Post Office box) _____

City, state, and zip code _____

FOR FAA USE ONLY (To be completed by issuing office)

This approval is for: RNP-10 under the conditions typed on the back of this authorization.

Authorization Number _____
Aircraft limitations (if applicable) _____
Program Tracking and Reporting Subsystem (PTRS) tracking number _____
Date of Issuance _____ Expiration Date _____

This authorization is subject to the conditions that all operations conducted on an oceanic RNP route are in accordance with the flight rules contained in International Civil Aviation Organization (ICAO), Annex 2, and that all operations outside of the United States comply with section 91.703, and Annex 2. The person responsible for crew operations or agent for service must accept responsibility for complying with the stated regulations by signing this document. This document is considered invalid until signed. If the person signing this document relinquishes responsibility, changes mailing address, or the aircraft changes ownership or base of operation, this letter becomes invalid and the signee should immediately notify the issuing office of the change. LOA's can be renewed via letter or fax request submitted at least 30 days before the expiration date, if no changes have been made. If any changes have been made, application for a new LOA must be made in the same manner as that required for the initial LOA.

Office Manager's Signature _____

APPENDIX 3. DOCUMENTATION REQUIRED TO COMPLETE THE APPROVAL PROCESS
(continued)

INFORMATION TO BE INSERTED ON THE BACK OF THE LOA

PRE-FLIGHT SPECIAL REQUIREMENTS: *Note: Operators should list any procedures that are utilized which are pertinent to the accuracy and time limit of the navigation capability (e.g., an approved Fault Detection and Exclusion (FDE) program is required if GPS is to be used - if utilizing a procedure detailed in an another FAA document, that document may be referenced and a copy attached to the application).*

OTHER INFORMATION AS DEEMED NECESSARY BY THE ISSUING FLIGHT STANDARDS DISTRICT OFFICE:

APPENDIX 3. DOCUMENTATION REQUIRED TO COMPLETE THE APPROVAL PROCESS
(continued)**FORMAT FOR LETTER TO RENEW LOA**

FROM: *[person or department requesting LOA]*
[company name (if applicable)]
[street address] (P.O. Box not acceptable)
[city, state, zip code]

TO: Federal Aviation Administration (FAA)
Flight Standards District Office
[street address]
[city, state, zip]

Dear Inspector:

Enclosed is a copy of our LOA, which is due to expire within the next 60 days, and a completed form requesting a new LOA for operations in Minimum Navigation Performance Specification and/or Reduced Vertical Separation Minimum airspace.

I/we further certify that all authorized crews are qualified to operate in oceanic areas.

Sincerely,

[person's signature responsible for crew operations or agent for service]
[typed name of person responsible for crew operations or agent for service]
[title]
[date]

NOTE: The letter should be sent to the office that issued expired LOA.

APPENDIX 4. TRAINING PROGRAMS AND OPERATING PRACTICES AND PROCEDURES

1. INTRODUCTION. The following items (detailed in paragraphs 2 through 4) should be standardized and incorporated into training programs and operating practices and procedures. Certain items may already be adequately standardized in existing operator programs and procedures. New technologies may also eliminate the need for certain crew actions. If this is found to be the case, then the intent of this appendix can be considered to be met.

NOTE: This Order has been written for a wide variety of operator types (parts 91, 121, 135, etc.), and therefore, certain items have been included for purposes of readability and completeness that may not pertain to all operations.

2. FLIGHT CREW QUALIFICATIONS. Operators should ensure that crews are knowledgeable in the guidance contained in AC 91-70, Oceanic Operations, An Authoritative Guide to Oceanic Operations, chapter 2, paragraphs 8d through 8z, pages 26 through 32 and in AC 90-79, Recommended Practices and Procedures for the Use of Electronic Long-Range Navigation, and that commercial operators include the topics contained in the guidance in their training programs.

3. FLIGHT PLANNING. During flight planning, the flightcrew should pay particular attentions to conditions which may affect operations in RNP-10 airspace (or on RNP-10 routes). These include, but may not be limited to:

- a. verifying that the aircraft is approved for RNP-10 operations;
- b. that the approval is for a time limit that will allow RNP-10 capability to exist for the total length of the flight;
- c. the reported and forecasted weather conditions on the route of flight;
- d. the requirements for GPS, such as FDE, if appropriate for the operation; and
- e. if required for a specific navigation system, accounting for any operating restriction related to RNP-10 approval.

4. PREFLIGHT PROCEDURES AT THE AIRCRAFT FOR EACH FLIGHT. The following actions should be completed during preflight:

- a. Review maintenance logs and forms to ascertain the conditions of equipment required for flight in RNP-10 airspace or on an RNP-10 route. Ensure the maintenance action has been taken to correct defects to required equipment.
- b. During the external inspection of aircraft, particular attention should be paid to the condition of navigation antenna and the condition of the fuselage skin in the vicinity of each of these antenna (this check may be accomplished by a qualified and authorized person other than the pilot, e.g., a flight engineer or maintenance personnel).
- c. Emergency procedures for operations in RNP-10 airspace or on RNP-10 routes are no different than normal oceanic emergency procedures with one exception, crews must be able to recognize and ATC advised when the aircraft is no longer able to navigate to its RNP-10 approval capability.

APPENDIX 5. CHECKLIST FOR RNP-10 APPROVAL APPLICATION PROCESS

1. OPERATOR PREPARES AN APPLICATION PACKAGE AS DESCRIBED IN PARAGRAPH 7E.
2. OPERATOR SELF-EXAMINATION. It is advisable that operators become familiar with paragraphs 7 and 8 before contacting the FAA. These sections provide the criteria for approvals by placing aircraft/navigation systems in groups. A knowledge of these sections provides the operator with an indication of how much time might be required in obtaining an approval. Group I approvals are administrative and can be granted as quickly as district office work loads will permit. Group II approvals may be made quite rapidly or may take longer depending upon the aircraft/navigation system configurations. Group III approvals will usually involve an extended time for evaluation and an approval may or may not be granted.
3. OPERATOR SCHEDULES A PREAPPLICATION MEETING with either CHDO for commercial operators, or FSDO for general aviation.
4. OPERATOR SUBMITS A FORMAL APPLICATION FOR APPROVAL in accordance with the FAA expectations discussed in the preapplication meeting. The formal application should be made in writing in a manner similar to those shown in appendix 3.
 - Figure 1 for Air Carriers
 - Figure 2 for General Aviation
5. OPERATOR TRAINS CREW. An RNP-10 airspace or an RNP-10 route is a special airspace. There are no legal requirements for general aviation operators to have specific training for RNP-10 operations; however, ICAO Rules demand that States ensure that the crew are qualified to operate in special airspace. Thus general aviation operators will be required to satisfy the Administrator that they are qualified. FAA Order 8700.1, chapter 222, Guidance for the Issuance of a Letter of Authorization, provides the ASI with guidance in this regard.
6. OPERATORS RECEIVE OPERATION SPECIFICATIONS OR AN LOA to operate in an RNP-10 airspace or on an RNP-10 route.
7. CREWS ARE AUTHORIZED TO PERFORM RNP-10 OPERATIONS for the time authorized within the parameters established for their navigation system configuration.

